



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
P.O. Box 1456
Alexandria, Virginia 22313-1456
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/931,324	08/16/2001	Michael S. Barnes	AMAT/4184/ETCH/CHAMBER.JB	3945

72588 7590 05/29/2003

APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

TRAN, BINH X

ART UNIT	PAPER NUMBER
----------	--------------

1765

DATE MAILED: 05/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/931,324

Applicant(s)

BARNES ET AL.

Examiner

Binh X Tran

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 March 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9 and 19 is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-18 and 20-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3-8, 10-18, 20-21, 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi (US 5,272,417) in view of Ohmoto et al. (US 6,413,876).

Respect to claim 1 and 14, Ohmi discloses an apparatus comprising:

a chamber (105) having a first electrode (107) disposed therein;

a substrate support (104) disposed in the chamber and providing a second electrode (i.e. susceptor electrode);

a high frequency (f1) source electrically connected to the first electrode (107);

a low frequency power source electrically connected to the second electrode (104) (See Fig 1A);

a impedance element connect to the first electrode (107) and the ground (Fig 1B, Fig 1D, Fig 4B, col. 7 lines 34-60).

Ohmi does not explicitly disclose the impedance element is a variable impedance element. However, Ohmi clearly disclose the use of the impedance element in the etching chamber. In an apparatus for processing a substrate, Ohmoto discloses variables impedance element connect to the substrate support electrode to reduce

damage on the wafer surface (col. 6 lines 29-67). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Ohmi in view of Ohmoto by using a variable impedance element because it will reduce the damage occurs on the wafer surface.

Respect to claim 3 and 23, Ohmi discloses the first electrode (107) and the second electrode (104) form a parallel plate electrode (Fig 1A). Respect to claim 4 and 24, Ohmi discloses the chamber is configured as an etch chamber. Respect to claim 5 and 15, Ohmi discloses the high frequency power source is adapted to delivered power between 100 MHz-250 MHz (col. 11 lines 49-54, read on the range of "between about 13.56 MHz and about 500 MHz). Respect to claim 6, Ohmi disclose the low frequency of 10-50 MHz (col. 6 lines 65-68, read on the range of 100 KHz to 20 MHz).

Respect to claims 7-8, 17-18 Ohmi disclose the impedance element comprise a inductor (L1 and/or L2 and/or L3) and a capacitor (C_s , C_{s2} , C_{s3}) (See Fig 4B, or 1B). Ohmi fails to disclose a variable impedance elements comprise at least one variable capacitor. The use of variable impedance elements has been discussed in previous paragraphs. Ohmoto discloses that the variable impedance elements comprise an inductor (14) and a variable capacitor (13) (Fig 3, col. 6-15). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Ohmi in view of Ohmoto by using a variable impedance element comprise a inductor and a variable capacitor because it will reduce the damage occurs on the wafer surface.

Respect to claims 10 and 20, Ohmi discloses the impedance elements (102, 402, 403) are adapted to tune at to the high frequency (f_1) (See Fig 1B) or low frequency (Fig

4B). The use of variable impedance elements has been discussed in previous paragraphs. Further Ohtoto also discloses that the variable impedance elements are adapted to tune to at least one frequency from the RF frequency (17) (Fig 3).

Claim 16 differs from the cited prior arts by the specific value of frequency. However, Ohmi discloses that the value frequency can be adjusted because it is a result effective variable. Result effective variables are commonly determined by routine experiment. The process of conducting routine optimization experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal frequency ranges as an expected result.

Respect to claims 11 and 21, Ohmi discloses the impedance elements (402 and 403) are adapted to tune to first resonant impedance at the low frequency (Fig 4B) and impedance element (102') tune to second resonant impedance at a high frequency (Fig 4B, col. 7 lines 18-25 and col. 12 lines 44-53). Respect claim 12, Ohmi discloses a high frequency ($f_2 = 100$ MHz) and the low frequency ($f_3 = 40$ MHz) are delivered to the electrode (104) and the impedance element (102') is connected to the electrode (107) (Fig 4B, col. 12 lines 36-68) the impedance element (402, 403) is connected to the electrode (104) (Fig 4B). Respect to claim 13, Ohmi disclose a high frequency (f_1) and the low frequency (f_3) are delivered to opposite electrode and a first impedance element (102) is connected to the electrode (107) and the second impedance element (402 or 403) is connected to the electrode (104).

3. Claims 2, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi in view of Ohmoto and further in view of Wu et al. (US 5,585,012).

Ohmi discloses a means for introducing a gas into the chamber (i.e. a gas distributor). However, Ohmi fails to disclose that the first electrode comprise a gas distributor. In an etching apparatus, Wu teaches the first electrode (14) comprise a opening for distribute gas into the chamber (col. 5 lines 9-12). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Ohmi and Ohmoto in view of Wu by having the first electrode comprise a gas distributor because it help to excite the gas into plasma phase as the gas pass through the first electrode.

Allowable Subject Matter

4. Claims 9, 19 are allowed.

Response to Arguments

5. Applicant's arguments filed 3-10-2003 have been fully considered but they are not persuasive.

The applicants argues that "there is no suggestion discerned in the references of modifying the devices disclosed therein in the direction of the present invention, nor does there appear to be any suggestion of the desirability of such modifications." The examiner disagrees with the arguments. As discussed in above, the examiner recognizes that Ohmi fails to disclose the variable impedance. However, Ohmi clearly teaches the use of the impedance. On the other hand, Ohmoto teaches to use variable impedance. Ohmoto further discloses the variable impedance will help to reduce the

damage occurrence ratio to the wafer (col. 6). The advantage of the variable impedance taught by Ohmoto is the reason to modify the apparatus of Ohmi. The examiner, therefore, concludes that there is a reason or suggestion to modify Ohmi in view of Ohmoto.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (703) 308-1867. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703)

Application/Control Number: 09/931,324

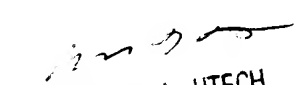
Page 7

Art Unit: 1765

872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Binh X. Tran
May 28, 2003


BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700